

Office of the West Virginia Attorney General



Elk River Chemical Spill INCIDENT REPORT

January 8, 2015

EXECUTIVE SUMMARY

On January 9, 2014, a spill of crude methylcyclohexanemethanol (MCHM) into the Elk River tainted the water for more than 300,000 West Virginians in nine counties. The leak resulted in a do-not-use order being issued, meaning citizens of Kanawha County and surrounding counties could not drink, cook with, or bathe in their water. The spill raised questions about why this incident happened and how similar crises could be avoided in the future.

The West Virginia Attorney General's Office had similar questions and officially launched an investigation into the incident on January 13, 2014. We pledged to provide citizens a clear and fact-based understanding of what transpired, and allow for informed, factual decisions to be made as to prevent these types of incidents in the future.

The report that follows is a summary of the Office's findings that resulted from our investigation into the incident. Significantly, the report details the causes of the leak at the Charleston tank farm and documents how years of neglect and deteriorating conditions were overlooked and ignored by both Freedom and its predecessors.

Among the most disturbing findings of our investigation was that Freedom employees and outside consultants warned of a potential catastrophic incident due to poor tank conditions and design problems for years, and in some cases offered solutions. In March 2010, an employee issued an Idea Form memo highlighting structural problems at the facility and provided options to correct the problem.

Specifically, the employee's memo stated that "tanks within the dike area are setting in water due to a lack of adequate drainage." The memo further stated:

"All of the tank bottoms for the ten large tanks at this facility have been replaced since original installation. Slope grade is not away from the tanks and water stands in numerous areas as well as in direct contact with the tank chime and {bottom}. This is the most critical point of a tank with respect to structural integrity. Any failure of this weld or steel plate would result in a potentially catastrophic failure."

The employee offered two alternatives to remedy the problem: 1) Do nothing and replace tank bottoms when loss of containment occurs, and/or 2) Dig trenches to try and move water away from tank chime and towards the sump. Based upon the investigation to date, Freedom appeared to have chosen Option 1, and the predicted loss of containment and catastrophic failure occurred.

Among the other key findings detailed in this report are the following:

- Two tanks, No. 396 and 397, were more than 75 years old and had holes in the bottom which resulted in chemicals escaping from both. Specifically, tank No. 396 had two holes in the floor measuring 5/8" x 21/32" and 1/4" x 9/32" that were located approximately 2 1/2 inches to 4 1/2 inches inside the tank wall. Tank No. 397 had a 0.2 cm hole.
- Chemicals escaped from the tanks, then flowed northwest to the containment wall in front of tanks 393 and 394.
- The chemicals leaked through and under the containment wall into the rubble-filled ground covering the hillside leading to the Elk River.
- The chemicals also traveled through a corroded culvert and/or pathways created by water leaking from the culvert. The culvert runs between tanks 395 and 394 and over the embankment to the river. Hence, there were at least two entry points in which chemicals were able to flow directly into the Elk River.
- Both tanks sat above a gravel/ soil ground. A concrete pad that existed around the base of each tank did not extend under the tank. When chemicals leaked out of the tank, it leaked directly into the gravel and soil underneath. It is not known how long the chemical had been leaking from the two tanks, but it is believed that it did not start on the day the leak was reported.
- Freezing conditions on Jan. 9, 2014, as well as days leading up to it, affected the leaching into the ground and caused it to pool on the concrete pad around the tanks.
- Containment walls designed to serve as a secondary containment system in case of a leak failed due to neglect and disrepair, which allowed the chemical to flow both underneath and through the cinderblock. The WVAGO investigators documented frozen substances coming out of the wall several days after the event.

- Self-inspection reports by Etowah employees dating back to 1998 repeatedly pointed out that the containment wall was in need of repair.
- Pads sloped down toward the base (chime) of the tanks. This allowed for dirt, mud, and debris to build up under the tank and for water to pool underneath and around it. In 2010, a Freedom Industries engineer expressed concern about the slope and position of the concrete pad.
- The riverbank in front of the tanks suffered severe erosion prior to the January 2014 spill, and had been noted going back to 2007. An environmental company provided four proposals to correct the erosion in 2009. None of the proposals appeared to have been accepted.
- Despite obvious warning signs, as well as internal and external inspections and reports highlighting potential problems, Freedom Industries and Etowah Terminal failed to take reasonable, necessary corrective action.
- The WVAGO investigation also determined that tanks No. 393 and 394 had developed a tilt (due to being located on fill) and were leaning toward the Elk River, with their tipping becoming more severe over time.

The WVAGO investigation spanned most of last year and resulted in an overwhelming amount of information and documentation of the scene and the events that took place on January 2014 at the Freedom Industries. While the investigation continues, sufficient evidence exists to articulate an understanding of the events that transpired on January 9, 2014 and many of the causes of the spill. Our report is intended to highlight the noteworthy evidence obtained during the investigation and provide a summary of the information obtained.

By providing factual, detailed information as to what transpired on January 9, 2014 and what caused the incident at Freedom, the public will be better informed.

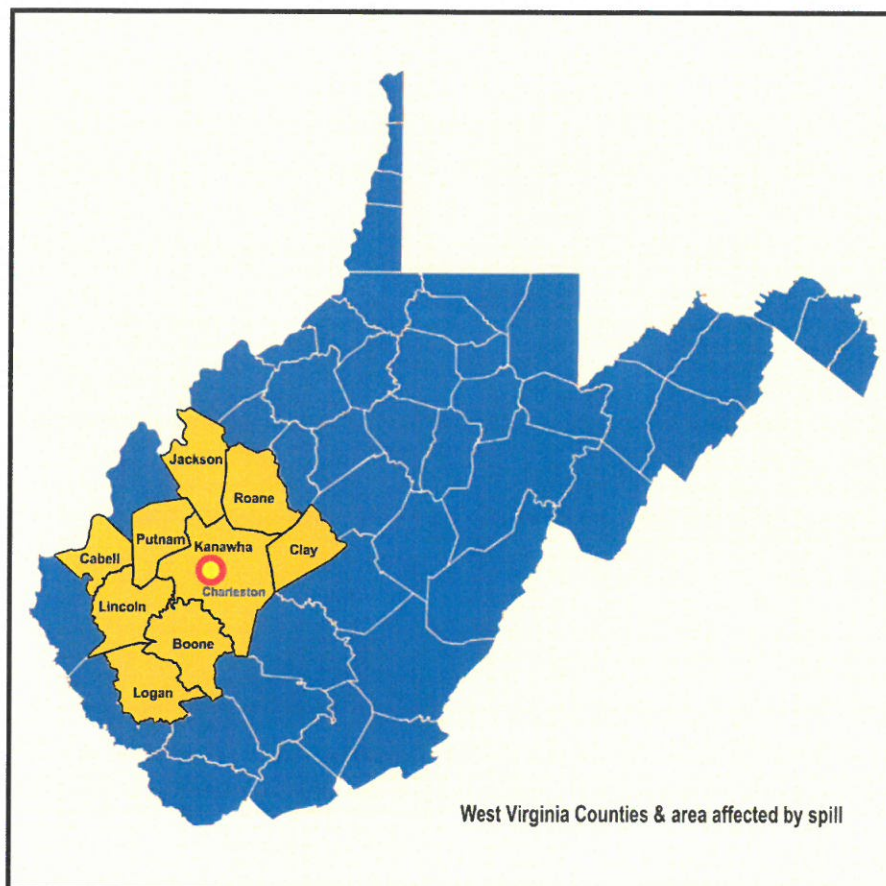
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1.0 INTRODUCTION

On January 9, 2014, at approximately 10:45 a.m., John O'Dell, an employee at Freedom Industries, Inc. discovered that a chemical was leaking from tank 396 located at the Etowah River Terminal in Charleston, West Virginia. The chemical (a blend of crude methylcyclohexanemethanol (MCHM) and PPH, a hydrophobic glycol ether)¹ flowed below and through the secondary containment wall and into the adjacent Elk River. The chemicals flowed 1.5 miles downstream and infiltrated the water filtration system of West



Virginia American Water. By 6:00 p.m., a mandatory Do-Not-Use order was issued, and more than 300,000 residents and countless businesses in a nine county radius were without potable water.

In the days that followed, businesses struggled to remain open, individuals stocked up on bottled water, and the economic, health, and emotional impact of the

Do-Not-Use order began to take its toll on the region and the State. When the Do-Not-Use order was fully lifted nine (9) days later, the safety of the water was still very much in question, and the questions as to how and why this contamination occurred began to mount.

¹ MCHM is a mixture of water and six chemicals used as a frothing agent for cleaning coal.

These questions continued through the 2nd session of the 81st West Virginia Legislature; bills were quickly introduced to address the safety of aboveground storage tanks (AST) such as the ones at Freedom Industries. As the Legislature worked towards a solution, the West Virginia Attorney General's Office was investigating the cause of the leak and the events that transpired on January 9, 2014.

This Report provides our office's focused examination and investigation of the events that transpired on January 9, 2014 and how the water contamination occurred. It details the findings of the West Virginia Attorney General's Office investigation into the chemical leak and seeks to answer the foundational questions as to "What happened on January 9?" and "How did it happen?". However, there are matters outside the scope of our investigation that are not discussed. In particular, this Report does not address the long-term health effects of the contamination, or a number of other serious public policy questions related to the spill.



2.0 SCOPE OF INVESTIGATION

On Monday, January 13, 2014, West Virginia Attorney General Patrick Morrissey publicly announced that his Office would investigate the water contamination incident at Freedom Industries. The announcement was the culmination of several days of meetings and public questions from the community as to how and why this incident occurred. The office formalized a task force of attorneys, investigators, and subject matter experts to investigate the incident. WVAGO investigators Gordon Ingold and Joseph Stiles were designated as the lead investigators.

2.1 *Objectives of Investigation*

The main objectives of the investigation were as follows:

- ◆ Determine the events that took place at Freedom Industries on January 9, 2014 relating to the chemical spill; and
- ◆ Determine and document the facts, conditions, and circumstances that resulted in the chemical(s) spilling into the Elk River.

2.2 *General Approach of Investigation*

The water contamination at Freedom Industries generated tremendous scrutiny by various State and Federal entities. Among the entities investigating the incident were the United States Attorney's Office for the Southern District of West Virginia (USASDWV), the Federal Bureau of Investigation (FBI), the United States Occupational Health and Safety Administration (OSHA), the United States Chemical Safety and Hazard Investigation Board (CSB), the United States Environmental Protection Agency (EPA), the United States Coast Guard (USCG), and the West Virginia Department of Environmental Protection (DEP). Though each entity had its own mission and purpose, it quickly became clear that the State of West Virginia needed to conduct an independent investigation. This investigation Report reflects that review undertaken by the Attorney General's Office.

The WVAGO investigators spent the next several months at the scene, attending daily briefings and documenting the scene at Freedom Industries. Ultimately, they were successful in conducting a comprehensive investigation and documentation of the incident scene.² In doing so, however, the WVAGO investigators were mindful of the concurrent criminal and administrative regulatory investigations, and were careful not to impede or disrupt any other entity's progress.

Overall, the WVAGO investigation sought to determine the root cause of the water leak and contamination, as well as an understanding of the events that transpired on January 9, 2014.

2.3 *Summary of Investigative Process*

The investigation into the Freedom Industries spill began officially on the morning of Monday, January 13, 2014, and continued until after the demolition of the ASTs was completed on October 1, 2014. The investigation continues through this day with ongoing analysis and documentation of the incident. While the investigation remains open, sufficient evidence exists to articulate an understanding of the events that transpired on January 9, 2014 and the root causes of the contamination of the Elk River.

As part of its investigation, the WVAGO conducted numerous witness interviews and reviewed thousands of pages of documents. Specifically, the WVAGO interviewed more than sixty individuals, including key individuals and employees of Freedom Industries, Inc., West Virginia American Water, and Diversified Services, LLC (a contractor for Freedom Industries).

During the WVAGO review, information and interviews were also sought and obtained from multiple other sources, including Freedom contractor Diversified Services, LLC, and West Virginia American Water. However, only a limited amount of documents were obtained from West Virginia American Water as the WVAGO was not willing to

² The WVAGO especially wishes to note the cooperative nature and professionalism of the investigators with the United States Chemical Safety Board. On many occasions, the investigators of the WVAGO and the CSB collaborated and cooperated in seeking information and documentation as part of their respective investigations. Indeed, the WVAGO gave the CSB copies of WVAGO photographs of the holes in tank 396 that were made public by the CSB during their presentation to a Congressional field hearing on Monday, February 10, 2014.

execute a confidentiality agreement prohibiting disclosure of certain documents it obtained.

The WVAGO also documented via photography and other means the scene at Freedom Industries. In total, the WVAGO has an overwhelming amount of information and documentation of the scene and incident. This Report is intended to highlight the noteworthy evidence obtained during the investigation, and provide a summary of the voluminous information garnered as part of this investigation.

3.0 ETOWAH TERMINAL SITE DESCRIPTION/HISTORICAL BACKGROUND

The Freedom Industries property consists of 4.548 acres located at 1015 Barlow Drive, Charleston, Kanawha County, West Virginia. The property is approximately 356 feet wide by approximately 937 feet long and sits between Barlow Road and the Elk River. This site is northeast of the Charleston city limits. It is bordered to the north by a wooded area, to the south by a residential area, to the east by a steep sloped wooded area bordering the runway of Yeager Airport, and to the west by the Elk River. The terminal is approximately 1.5 miles upriver from the West Virginia American Water Plant.

The physical size and number of above ground storage tanks (ASTs) at the location of the water leak on January 9, 2014, has evolved over time. The area transformed from agricultural land to a small tank farm to having more than twenty storage tanks of varying sizes located on the property. The historical evolution of the physical make-up of the facility also impacted the growing usage of the property, and as explained later in this report, partially contributed to the contamination of the Elk River.

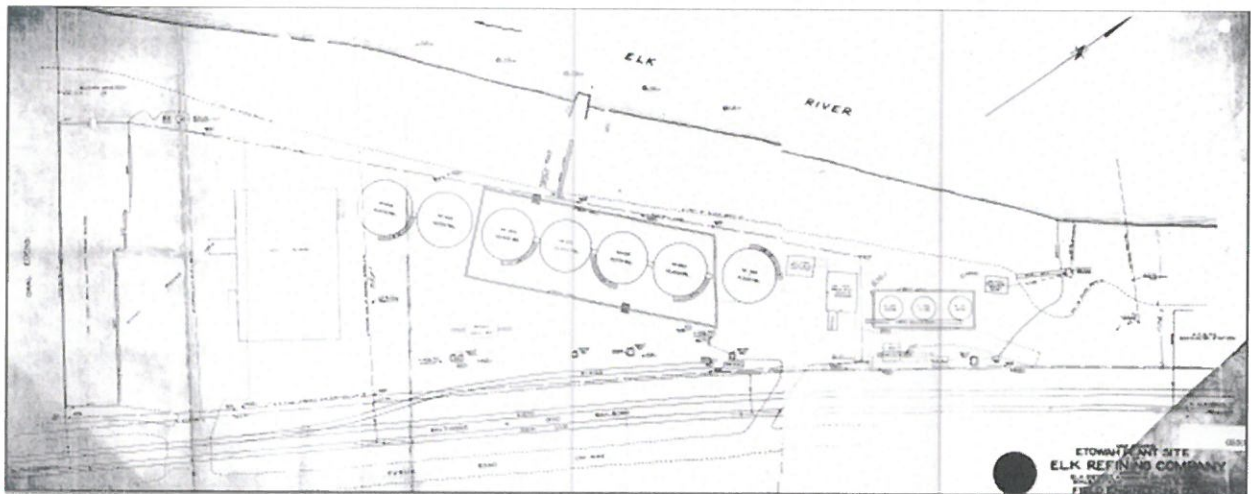
3.1 Historical Use and Growth of the Property

On December 28, 1938, Elk Refining Company purchased a 1.56 acre tract of land (identified as Plot 32 on Elk District Map 44L) from Edith Bowers Bailey and Homer Bailey. At the time of the purchase, the land was being used primarily for agricultural purposes by the Baileys.

Elk Refining Company was a petroleum company and installed the first AST on the site in 1938. Additional ASTs were added by Elk Refining as the petroleum bulk storage facility expanded.

On August 30, 1941, Elk Refining Company purchased an additional 1.3 acre tract of land (identified as Plot 31 on Elk District Map 44L) from Delia Bowers and James Bowers. Then, on July 30, 1947, Elk Refining purchased another 1.0 acre tract of land (identified as Plot 30 on Elk District Map 44L) from Ambrose C. Smith and his wife. On January 9, 1948, Elk Refining Co. purchased a 1.01 acre tract of land including the former one-story "Bower's School" building (identified as Plot 33 on Elk District Map 44L) from the Kanawha County Board of Education. In 1950, Elk Refining constructed the warehouse/office and garage on the property. By 1950, ten of the thirteen above ground storage tanks had been erected. Tanks 393, 394, and 405 were added by 1954.

As of March 31, 1950, the facility along the Elk River looked as follows:



On January 1, 1970, Elk Refining Company merged with Pennzoil United, Inc., and continued to operate the facility as a petroleum storage facility. Pennzoil United, Inc. later became Pennzoil-Quaker State (PQS).

Added over a period of time, there were several non-numbered ASTs at the site that were smaller in size and used for the storage of various products. The non-numbered ASTs included, but were not limited to, the following:

1. 275 gallon diesel additive AST installed during 1999 inside the dike area at the fuel loading rack,

2. 275 gallon drip oil AST installed during 1999 inside the dike area near the oil loading rack,
3. 550 gallon AST installed during 1991 as part of the vapor recovery system inside the dike area,
4. 320 gallon kerosene heating oil AST in the garage/storage building, and
5. 30 gallon hydraulic oil AST in the garage/storage building.³

Significantly, as the ASTs were built and added, a containment wall was erected on the property and around certain ASTs. The containment wall was intended to serve as a secondary containment system should there be a leak or spill of an AST.

3.2 Facility growth under Etowah River Terminal, LLC

On November 30, 2001, Pennzoil-Quaker State sold the property to Etowah River Terminal, LLC. The Etowah River Terminal, LLC, operated the facility as a bulk storage terminal for freeze conditioning agents.⁴ These chemicals differed from the prior usage of the AST's under PQS, which held primarily petroleum products.

Although Etowah River Terminal, LLC merged with Freedom Industries, Inc., on December 31, 2013, the facility was not changed by Freedom Industries, Inc. after the purchase until the incident on January 9, 2014.

3.3 Facility as it existed on January 9, 2014

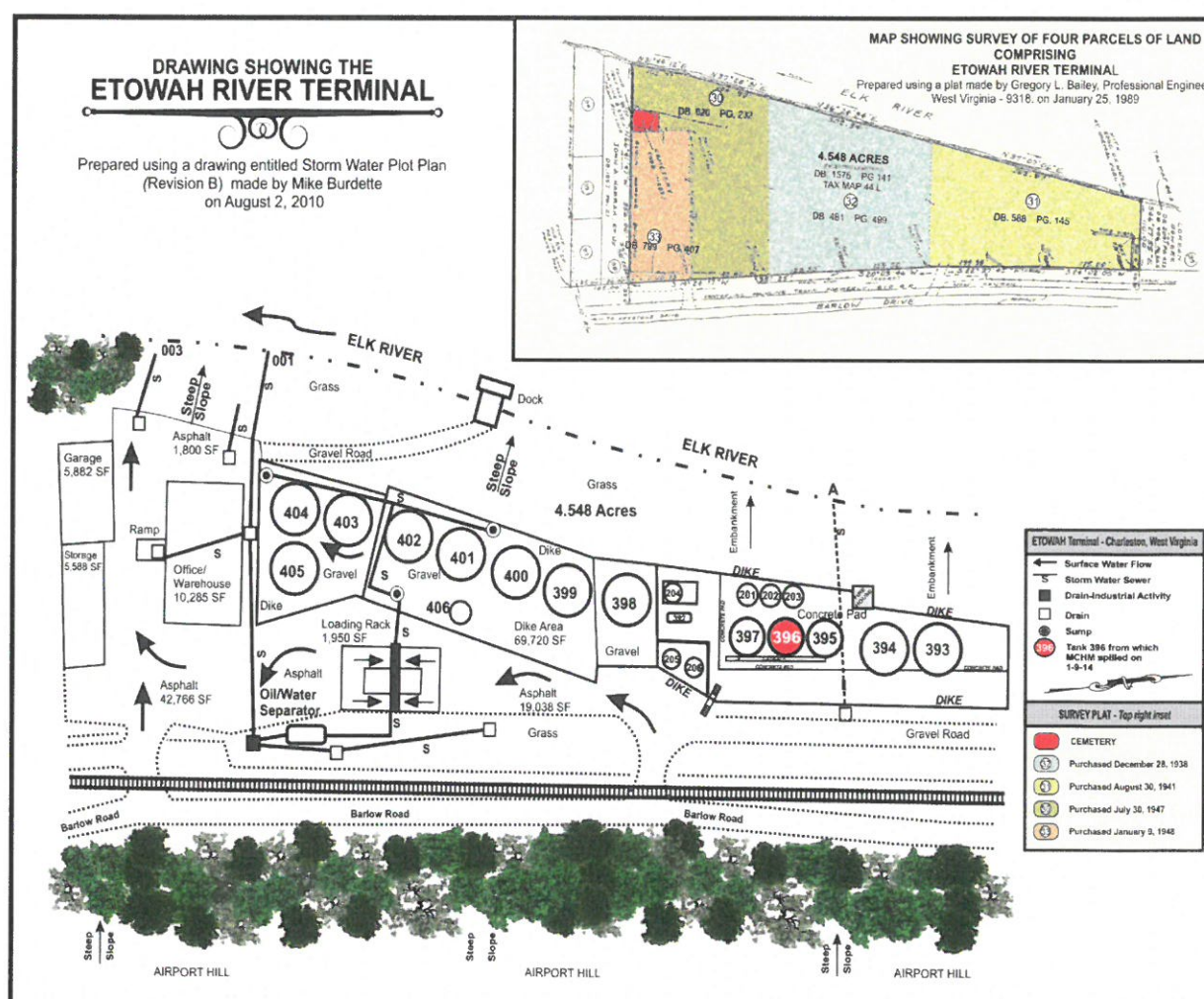
On January 9, 2014, the property consisted of more than 20 tanks, a warehouse/office and a garage. Additionally there was a storage unit and two loading zones on the property. The loading zones were used by trucks for the loading and offloading of chemicals in the tanks.

³ Application to participate in the Voluntary Remediation Program, Pennzoil-Quaker State Company, Etowah Terminal No. 5117, Charleston, W.V. Prepared by IT Corporation, Dunbar, W. V. November 2001, Table 1, Aboveground Storage Tanks PQS Etowah Terminal Facility

⁴ Additional Site Characterization Sampling and Analysis Plan, Former Pennzoil-Quaker State Etowah Terminal Charleston, West Virginia, VRP No. 04506, Prepared by Shaw Environmental, Inc.

As reflected in the figure below, the tanks are surrounded by a containment wall (a.k.a. dike) around the tanks. The containment wall was found to have been divided by four (4) such structures:

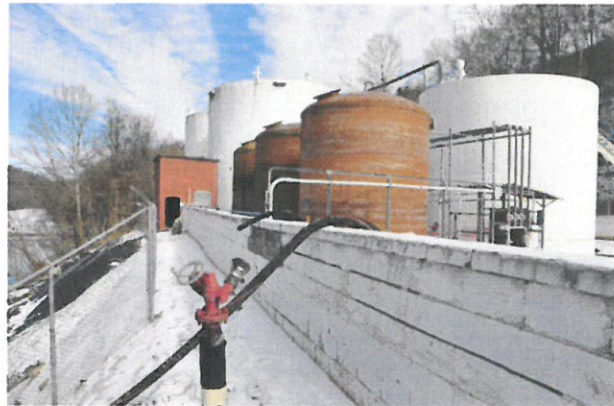
- the first or southernmost dike surrounded tanks 403, 404, 405;
- the second dike surrounded tanks 399, 400, 401, and 402;
- the third dike surrounded tank 398;
- the fourth dike surrounded tanks 201, 202, 203, 204, 205, 206, 392, 393, 394, 395, 396, and 397.



The containment walls were constructed of brick or cinderblock, and were generally topped or covered with concrete.

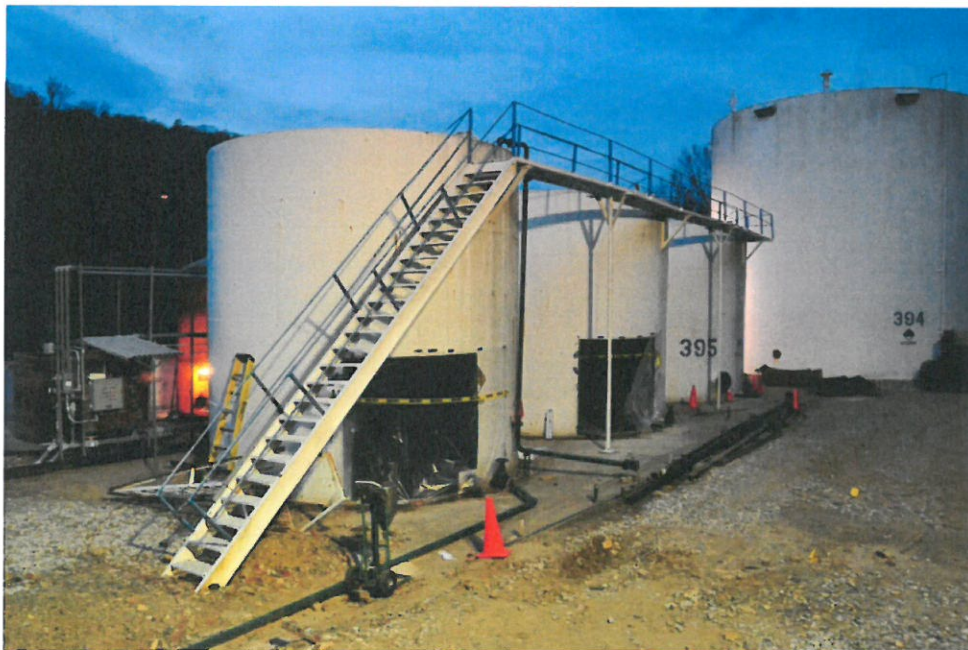


Containment wall facing Barlow Drive



Containment wall facing Elk River

In addition to the containment wall, some of the ASTs were surrounded by concrete pads.



The concrete pads, however, did not extend underneath the ASTs. Instead, there was gravel or rock underneath each AST.

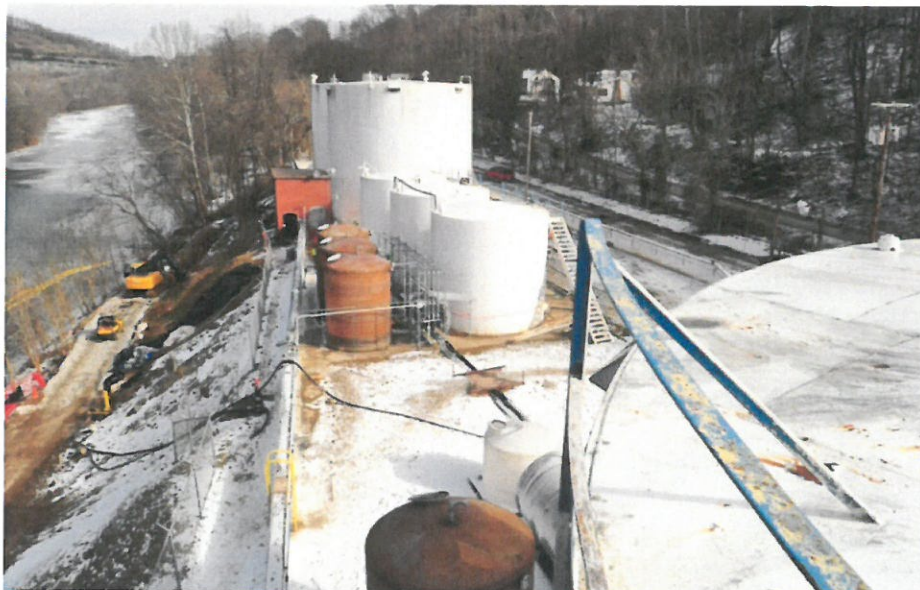


Although taken several days after the incident, the photo below reflects the ASTs and containment wall location on or about January 9, 2014.



3.4 Tank 396

Tank 396 was one of more than twenty tanks on the property of Freedom Industries, but is of primary focus since its leak resulted in the chemical spill on January 9, 2014. This tank was built for Elk Refinery in 1938; and was one of the first three tanks on the property. The three tanks, 395, 396, and 397, are of the same construction type and dimensions.



The tanks are 20 feet high and have a diameter of 20 feet with capacities believed to be 46,200 gallons each. While used by Freedom Industries (and previously by Etowah Terminal

LLC), tank 396 contained crude MCHM, which has been widely reported as a frothing agent used to clean coal. According to the Remediation Plan prepared by Civil and Environmental Consultants, Inc., dated April 8, 2014, the tank held 88.5 percent crude methylcyclohexanemethanol (MCHM), 7.3% PPH (a hydrophobic glycol ether), and 4.2% water by weight on January 9, 2014.⁵

Tanks 396 and 397 apparently contained this chemical product since approximately 2009. Prior to 2009, tank 396 was reported to have contained glycerin. Diversified Services was retained by Etowah Terminal to remove the glycerin product and clean the tank in preparation for the MCHM chemical product. It is also believed that a liner/patch was placed in the base of tank 396 prior to introduction of the MCHM product. While the liner/patch was present at the time of inspection by the WVAGO in January 2014, our office was unable to locate evidence documenting its installation.

4.0 BACKGROUND ON FREEDOM INDUSTRIES, INC.

According to their website, Freedom Industries, Inc., stated that it was a

“full service producer of specialty chemicals for the mining, steel, and cement industries. Founded in 1986, and located in Charleston, West Virginia, Freedom Industries, Inc., is a leading producer of freeze conditioning agents, dust control palliatives, flotation reagents, water treatment polymers and other special chemicals.”

Freedom Industries was organized as a corporation on February 10, 1992, by Carl L. Kennedy, II. Over time, the company made several filings with the West Virginia Secretary of State to establish new companies, dissolve companies, merge companies, or change officers.

The company, as it existed on January 9, 2014, had only been constituted since December 31, 2013, when four companies- Freedom Industries, Inc., Etowah River Terminal, LLC, Poca Blending, LLC, and Crete Technologies, LLC- merged under the

⁵ Remediation Plan, Tank 396 Release, prepared by CEC, April 8, 2014

umbrella of Freedom Industries, Inc. As of January 9, 2014, the listed corporate officers of Freedom Industries, Inc. were:

Gary Southern	President and Treasurer
David McCombie	Vice-President
Matthew Mazefsky	Secretary

Following the leak, on January 17, 2014, Freedom Industries, Inc. filed for Chapter 11 bankruptcy. In subsequent filings, Freedom Industries reported that two companies, VF Funding and Mountaineer Funding, were prepared to loan Freedom up to five million dollars to allow them to continue operating during their reorganization. West Virginia Secretary of State records show that Mountaineer Funding was incorporated in West Virginia on January 17, 2014. The sole member listed is J. Clifford Forrest.

According to Freedom's bankruptcy documents, Chemstream Holdings owns 100% of Freedom Industries.⁶ J. Clifford Forrest owns Chemstream Holdings, which was formed in 1997. The address is Chemstream Inc., 166 Commerce Drive, Stoystown, PA 15563. J. Clifford Forrest also owns Rosebud Mining in Kittanning, PA.

4.1 Etowah River Terminal, LLC

Etowah River Terminal, LLC was formed on September 27, 2001, in West Virginia as a limited liability company by Dennis Farrell, who served as the manager and organizer. It was located on Barlow Road, at the site of Freedom Industries. On August 3, 2005, Etowah River Terminal, LLC was administratively dissolved by the West Virginia Secretary of State. Etowah River Terminal operated as a general partnership until November 15, 2011, when the partners- Dennis P. Farrell, Charles Herzing, and William Tis- converted the partnership into a limited liability company. On December 30, 2013, a filing with the West Virginia Secretary of State removed Farrell as the manager and replaced him with J. Clifford Forrest. In addition, Matthew Mazefsky was listed as the agent for service of process. On December

⁶ B1 (Official Form 1) (04/13) United States Bankruptcy Court, Southern District of West Virginia Voluntary Petition

31, 2013, Etowah River Terminal was terminated when it was merged with Freedom Industries, Inc.

4.2 Poca Blending, LLC

Poca Blending, LLC, (Par Industrial Park, Plant Road, Bldg. #1, Bay #7, Nitro, WV 25143) was formed on October 13, 1999, by Carl L. Kennedy II. Freedom Industries and SD Asset Partners (300 BSNS Center Drive, Suite 302, Pittsburgh, PA, 15205) were listed as both members and organizers of Poca Blending, LLC. On August 3, 2005, Poca Blending, LLC was terminated due to failure to file an annual report. On November 26, 2013, it reorganized as a limited liability company with Dennis Farrell listed as the agent for service of process and Daniel J. Cohn listed as organizer. On December 31, 2013, it merged with Freedom Industries and listed J. Clifford Forrest as the manager, replacing Farrell and Cohn. Matthew Mazefsky was the agent for service of process.

4.3 Crete Technologies, LLC

Crete Technologies, LLC, was formed on October 10, 2008, in Delaware. Farrell is listed as the agent of process and Freedom Industries as the member-manager. William Tis was the president of Crete. On December 30, 2013, a change of officers was completed, which identified Matthew Mazefsky as the agent for service of process and J. Clifford Forrest as the manager.

5.0 WHAT TRANSPIRED ON JANUARY 9, 2014

One of the central purposes of the WVAGO investigation was to determine and document, where possible, the events that transpired on January 9, 2014. During the course of the WVAGO investigation, multiple interviews were conducted and documents obtained that allowed for the creation of a timeline of events. While some times and dates may not be exact due to incomplete information, the following events are believed to have transpired on January 9, 2014.

5.1 Early Morning/Initial Reports

At approximately 5:00 a.m. on Thursday, January, 9, 2014, a Charleston Fire Department Paramedic Shift Commander reported a detection of a “licorice” type of “sweet smell” over a very large area in Charleston.⁷ The source of the odor was unknown at the time. At 8:16 a.m., West Virginia Department of Environmental Protection received a complaint of an odor or something in the air at the Interstate 77 and 79 split.⁸

At 9:23 a.m., Kanawha County 911 began receiving calls reporting “a very strong chemical smell.” Charleston Fire Department personnel responded and monitoring equipment tested negative.⁹ As a response to odor complaints, Charleston Fire Department and Kanawha County Emergency Management personnel responded to the Interstate 77 and 79 split.

In addition, personnel from Kanawha County Emergency Management responded to the Etowah River Terminal on Barlow Drive to inquire about the source of the odor complaints. Upon arrival at the terminal, the emergency responders met with DEP personnel, who were already on site, and Dennis Farrell (with Freedom Industries). KCEM personnel were told that DEP was handling the complaint, and deferred to their direction.

At 10:36 a.m., Freedom Industries, Inc. employee John O’Dell clocked in at the main office building. After clocking in, John O’Dell checked purchase orders for the day and found that a tanker truck was due at the facility to obtain MCHM. John O’Dell left the office building located at the south end of the terminal property. He indicated that he headed toward the tanks containing MCHM (tanks 395, 396 & 397) to prepare for the tanker truck load that was scheduled. Mr. O’Dell traveled approximately 506 feet, went across a containment wall stairway, and then observed that a liquid had pooled around tank 396. Upon closer examination, he confirmed that MCHM had pooled around the tank and had flowed towards the northwest block retaining wall. He was able to observe a ripple of MCHM at the base of tank 396 that he described as a point where MCHM was running up from under the tank onto the concrete pad surrounding it. He estimated a two foot ring of MCHM around the entire base of tank 396.

⁷ Kanawha County 911 Detail Call for Service Report 2014-00000040

⁸ DEP Air Quality Complaint Investigation Form CH-2014-0193

⁹ Kanawha County 911 Detail Call for Service Report 2014-00000431

Mr. O'Dell left the area and began to return to the main office to report the spill. As he was returning to the office, he met Dennis Farrell and members of the DEP, who were walking north toward the site of the spill. Mr. O'Dell made them aware of the spill and those individuals went to the area of tank 396. Mr. O'Dell notified the driver of the waiting tanker truck that instead of transferring the amount of the purchase order, he had to fill the truck to capacity. Mr. O'Dell's intent at the time was to fill trucks to capacity in an attempt to drain as much of the MCHM from tank 396 as possible.

In the minutes immediately following discovery of the spill, Freedom Industries contacted Diversified Services, LLC (the owner of the waiting tanker truck and contractor to Freedom Industries) to stop the leak and recover the lost material to prevent further contamination. Diversified Services mobilized additional trucks to respond to the scene. Diversified owner, Dan Kessler, estimates his personal arrival on scene between 11:00 a.m. and noon. Freedom Industries, Inc. also contacted Clean Harbors, an environmental company, to set up booms in the river and deploy vacuum equipment.

5.2 Mid-day/notifications & clean-up

At approximately 11:56 a.m., Jon Jarvis (Water Quality and Compliance Supervisor at West Virginia American Water) was first notified of the spill by DEP employee Richard Hackney.¹⁰ DEP employee Rusty Joins also made a phone call to WVAW at approximately 12:15 p.m. His call went to the out-of-state call center at Alton, Illinois, and the recipient of the call had a difficult time understanding where the spill occurred. Further, DEP notes in Order NO: 8028 dated January 10, 2014, that Bob Reynolds, Freedom's safety officer, reported the spill to the Emergency Response Spill Hotline at 12:05 p.m.¹¹

After receiving notification of the spill, West Virginia American Water employee Jon Jarvis checked with the water plant operator at WVAW. Specifically, Jarvis checked with the plant operator Steve McKinney to determine if there was any indication of chemicals in the raw water. In addition, he asked Mr. McKinney to do his twelve o'clock check. Normal protocol calls for the operator to perform water testing every two hours.

¹⁰ Timeline provided by Jon Jarvis

¹¹ DEP Order NO: 8028 Issued under the Water Pollution Control Act and the Groundwater Protection Act.

Mr. Jarvis then drove to Etowah River Terminal, arriving at 12:30 p.m. where he met with DEP official Mike Dorsey. While at the terminal, Mike Dorsey took Jon Jarvis down to the containment wall toward the river bank. Mr. Jarvis indicated that he observed an ice shelf of about ten feet along the river bank. On the other side of the ice shelf was a sheen on the water measuring approximately three feet by six feet.

At 12:52 p.m., Jon Jarvis called West Virginia American Water employee Todd Reedy and told him to turn on the powder activated carbon. This was an action that had not been used in twenty years, according to Jarvis.

At 1:00 p.m., Jon Jarvis called WVAW supervisor Billie Suder and informed her of what was going on. At this time Mr. Jarvis was provided an MSDS for MCHM. Up until this point, Mr. Jarvis had been verbally informed that the purported chemical was a flocculant. However, upon reviewing the MSDS, he discovered that the ingredients were alcohol based. Jon Jarvis questioned whether the chemical was in fact a flocculant as had been purported.

It was not until approximately 1:30 p.m. that Mr. Jarvis learned from discussions with DEP that MCHM was in fact a frothing agent, and not a flocculant. Mr. Jarvis returned to West Virginia American Water at 1:50 p.m.

At 1:49 p.m., Kanawha County Emergency Services confirmed that the source of the odor was the Etowah River Terminal. They were told that EPA and DEP Air Quality were on scene and the spilled chemical was MCHM.¹²

5.3 Afternoon/Early Evening & Do Not Use order

In the hours that followed the discovery, work to contain and collect the spilled product continued around the clock with the input of DEP, EPA, and the Coast Guard. Other entities, including Diversified and Clean Harbor, assisted with the containment and recovery of the spillage into the Elk River.

Upon returning to WVAW, Mr. Jarvis instructed the continued use of carbon to combat any chemicals that may infiltrate the system. It was believed at the time that the carbon would handle any potential chemical infiltration. Meanwhile, the WVAW continued its normal water testing.

¹² Kanawha County 911 Detail Call for Service Report 2014-00000113

Throughout the afternoon of January 9th, many of the senior officials at WVAW were in their offices in Charleston. The day had been scheduled for annual employee performance reviews and meetings continued as scheduled.

At 2:00 p.m., WVAW detected a presence of MCHM inside the plant's water filtration system. Around 4:00 p.m., Jon Jarvis was informed that the chemical had breached the filtration. Interviews/meeting then ceased and the employees/officers of WVAW sought consultation from in-house experts and the WVDHHR as to how to handle the breach.

At 5:45 p.m., West Virginia American Water, after consulting with DHHR and other entities, issued a Do Not Use Order. The Do Not Use Order remained in effect the remainder of the night, and would not ultimately be lifted until nine days later.

6.0 CHEMICAL LEAK AND CONTAMINATION OF THE ELK RIVER

The WVAGO investigation revealed and documented the source of the chemical leak



at Freedom, the path through and under the containment wall, and the subsequent release into the Elk River.

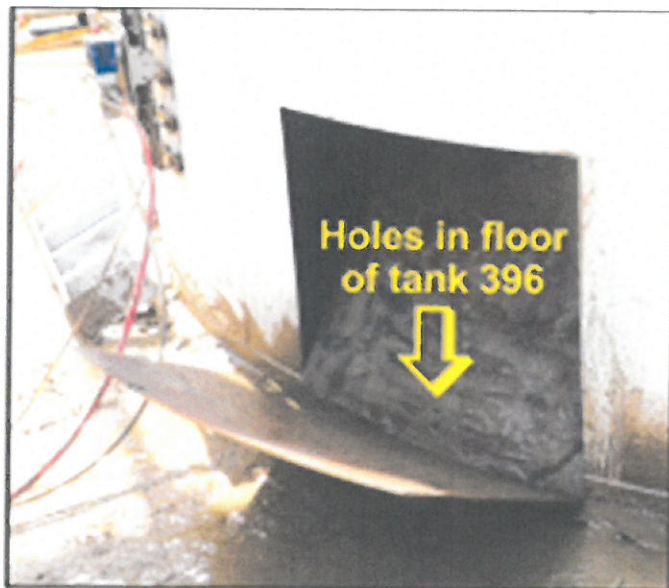
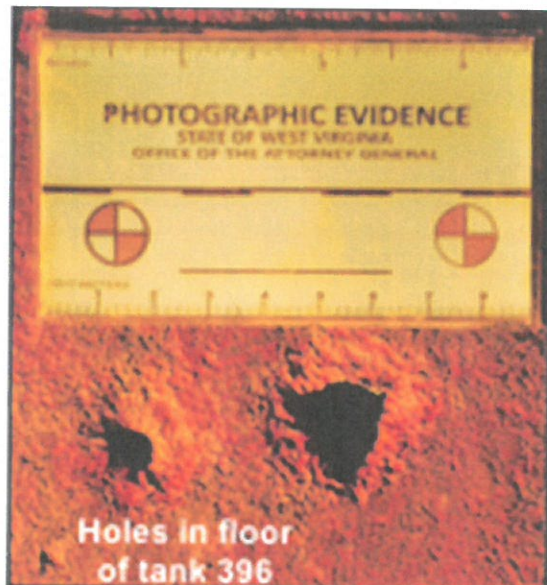
In particular, the investigation revealed that chemicals escaped from tank 396 and tank 397, then flowed northwest to the containment wall in front of tanks 393 and 394.

The chemicals then leaked through and under the containment wall into the rubble-filled ground leading to the Elk River. The chemicals also traveled through a corroded culvert and/or pathways created by water leaking from the culvert. This culvert ran between tanks 395 and 394 and over the embankment to the river. There were thus at least two entry points in which chemicals were able to flow directly into the Elk River. The source and resultant contamination are detailed more fully below.

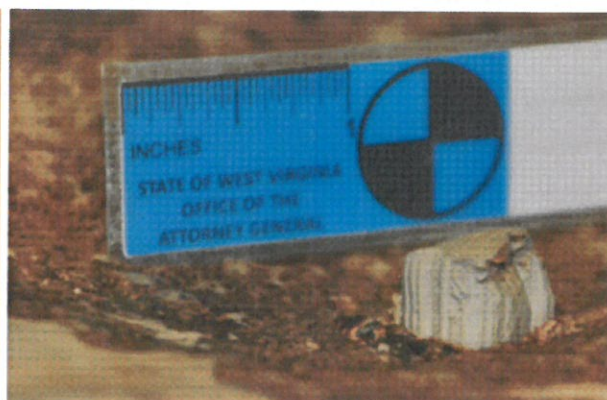
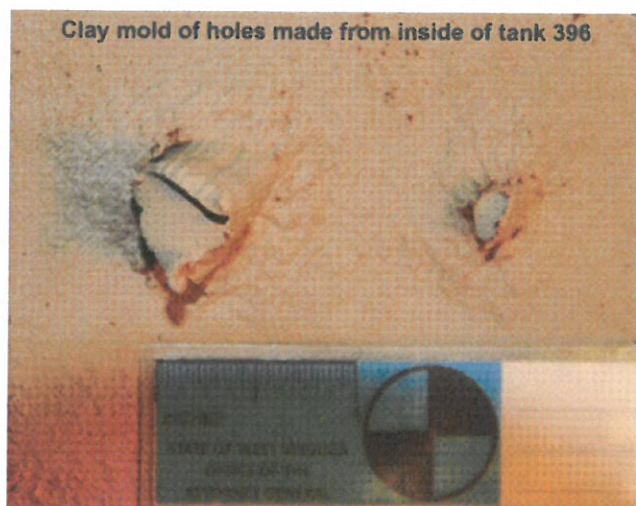
6.1 Holes in Tank 396 and Tank 397

During the course of the investigation, the WVAGO determined that holes existed in the bottom of two aboveground storage tanks at Freedom Industries. Both tank 396 and tank 397 contained MCHM product that escaped from their respective containers and ultimately leaked into the Elk River.

In particular, an inspection of tank 396 revealed that two holes existed on the floor. The first (larger) hole measured approximately $5/8"$ x $21/32"$, while the second (smaller) hole measured approximately $1/4"$ x $9/32"$. The holes in the bottom of the tank are positioned approximately $2\frac{1}{2}$ inches to $4\frac{1}{4}$ inches inside the tank wall.



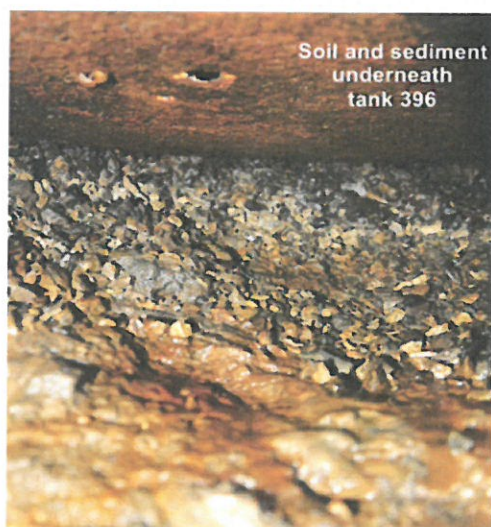
As part of its investigation, the WVAGO additionally obtained and produced clay moldings of the holes to document their respective size and shape.



In addition, a later inspection of tank 397 revealed that it also had a small 0.2 cm hole in its base.

6.2 Flow into the Gravel and Concrete Pad

Both tanks 396 and 397 sat above a gravel/soil ground. There was a concrete pad that existed around the base of each tank, but did not extend underneath the tank.



The WVAGO investigation revealed that upon leaking from its respective ASTs, the MCHM chemical product leached into the gravel/soil immediately beneath it. The length of time for the leak is unknown, but based upon observations of corrosion around the holes and tank, the holes existed prior to January 9, 2014.¹³

¹³ During the demolition of the tanks, sections of the tanks, including those portions containing the holes, were removed and preserved by the United States Chemical Safety Board. Testing of these sections may be able to reveal the length of time of the corrosion around the holes and provide a better understanding as to the time period that the tanks were compromised and leaking chemical product.

The leakage is generally believed to have leached into the ground beneath the tanks prior to January 9, 2014. While WVAGO investigators were unable to determine the start of the leakage, the extreme cold temperatures on and prior to January 9, 2014, affected the disbursement of the chemical on January 9, 2014. Due to the freezing conditions, the product was unable to readily leach into the ground and therefore escaped from the tank on to the concrete pad around the tanks.

6.3 Containment Wall Breach

All ASTs were surrounded by a containment wall that extended the length of the property. This was to serve as a secondary containment system in case of a leak. The WVAGO investigation revealed that the containment wall failed and chemical product flowed both through and underneath the containment wall. In particular, the WVAGO was able to document frozen substances coming out of the wall several days after the event.





6.4 Two Paths into the Elk River

The chemical pooled in and around the tanks and began to spread in a northwest direction towards tanks 393 and 394. The flow of chemical product had a direct path out of the enclosed area toward the Elk River through two primary paths.

First, the ground underneath tanks 393 and 394 contained porous fill dirt that allowed the product to leach into the ground and funnel towards the Elk River. Although the containment wall extended past tank 393 and 394, the deteriorated condition of the wall allowed chemical product to escape through the wall and down the hill towards the Elk River.

Second, a culvert running underneath the property became deteriorated and broken, thus facilitating the water flow into the Elk River. The WVAGO investigation indicates that the chemical product leaked into openings in the culvert and provided a more direct path into the Elk River.



6.5 General Summary

Overall, the WVAGO investigation revealed that the chemical product escaped through holes in tank 396 and tank 397, into the ground and over the concrete pad. The chemical escaped through the deteriorated containment wall and flowed in a northwest direction. Additional product escaped the containment area through the fill dirt and underneath the containment wall near tanks 393 and 394, as well as through a buried culvert running underneath the property.

7.0 CAUSES OF THE ELK RIVER CONTAMINATION

In addition to detailing what happened on January 9, 2014, the other central purpose of the WVAGO investigation was to determine and document, where possible, the cause of the leak and contamination of the Elk River. During the course of the WVAGO investigation, multiple interviews were conducted, documents obtained, historical

photographs reviewed, and personal observations combined to establish a clear understanding as to the root causes of the Elk River contamination.

The WVAGO investigation revealed long-term neglect of the ASTs, containment walls, and dangerous conditions surrounding the property. As detailed more fully below, the investigation concluded that tanks 396 and 397 were more than 75 years old and showed obvious signs of deterioration. Similarly, the containment wall needed major repair and structural reinforcement, and its usefulness as a secondary containment system was significantly diminished. Further, the failure to remedy or correct the presence of water from sources outside of the property led to deterioration of the facility. Finally, the use of fill dirt to alter the contours of the embankment between the tank farm and the Elk River for the placement of additional tanks contributed to the flow of the chemical into the river, and created another potential AST catastrophe.

Overall, the warning signs were open and glaring, yet were severely neglected and ignored. Sadly, the conclusions reached herein were recognized by Freedom Industries employees more than four years prior to the ultimate contamination. A memorandum authored by Mechanical Engineer Mike Burdette, dated March 31, 2010, summarized the problem as follows:

- “Tanks within the dike area are setting in water due to a lack of adequate drainage.”
- “Slope of grade is not away from the tanks and water stands in numerous areas as well as in direct contact with tank chime. This is the most critical point of a tank with respect to structural integrity. Any failure of this weld or steel plate would result in a potential catastrophic failure.”

Mr. Burdette proposed two (2) alternatives in his memorandum:

1. Do nothing and replace tank bottoms when loss of containment occurs.
2. Dig trenches to try to move water away from tank chime and towards the sumps.

Based upon information available to the WVAGO, evidence does not suggest that any affirmative action was ever taken to address the structural problems of the facility. As predicted by Mr. Burdette, a catastrophic failure and a loss of containment occurred. The result was a loss of potable water for more than 300,000 individuals, closures of businesses and schools, and a devastating public health and economic impact on the community.


While the memorandum of 2010 foreshadows the January 9, 2014 incident, a closer look at the contributing causes reveals numerous warning signs and areas of neglect that should have been addressed prior to the spill.

7.1 Improper Drainage on the Property and Presence of Water from Outside Sources

Due to the location of the facility, a considerable amount of water runoff entered the property. The sources include run-off from the airport hill above the facility, storm drainage or a possible natural spring on Barlow Drive, and a deteriorating/eroding culvert.

The run-off from the airport hill was documented by Etowah River Terminal General Manager Roger Arthur, who on January 15, 2009, prepared a letter to the West Virginia Department of Environmental Protection, Division of Waste and Water Management, Permitting Section regarding Etowah River's DMR for 2006. In the letter, Mr. Arthur reported the following:

"[O]utlet #001 has continued to show some high results. During our review of procedures impacting stormwater, we have determined that, during heavy rainfall, a significant amount of mud and unknown other materials wash into our parking lot from the hill across the road and airport above. Because this is beyond our control, no changes are being made to plant procedures."¹⁴



¹⁴ Letter from Roger Arthur to DEP dated January 15, 2009

To compound the water problem, the storm water drainage on the east edge of Barlow Drive proved inadequate in collecting and diverting the water. On June 11, 2009, Bob Reynolds, regulatory and environmental manager at Etowah River Terminal, prepared a letter to the West Virginia Department of Environmental Protection, Division of Waste and Water Management, Permitting Section regarding their application for renewal of stormwater permit WVG610920. In this letter, Mr. Reynolds noted the following:

“Storm drains on the East side of Barlow Drive are collapsed, allowing run-off from the airport to wash over the road into the ERT parking lot. During heavy rains this results in silt and mud going into outlet 003.”¹⁵

During the course of our investigation, Freedom officials mentioned during a daily briefing that an active spring located on the east side of the Freedom property near the storm drain may have contributed to the excess water flowing across the property. We were not able to confirm this fact in our review.

The property had other problems as well. For example, a metal culvert running underneath the tank farm designed to carry stormwater to the river corroded, allowing



Provided by
Babst Calland

water to make its own path or pathways under the facility property. This culvert traveled east to west under the facility in the area just north of tank 395. During the course of the investigation, contractors located, excavated and exposed a section of this culvert. In the area that was exposed, a large void could be seen in the south side of the

culvert wall. Investigators photographed the culvert and a clear liquid that traveled from

¹⁵ Letter from Bob Reynolds to DEP, June 11, 2009

the culvert to the surrounding soil. In addition, contractor Charles Monk with Diversified Services, LLC, produced a photograph to document the inside of the culvert. Mr. Monk reported that this photograph showed the culvert as it traveled from the east toward the Elk River. This culvert is the same as the one shown in the aerial images taken in 2007 and 2010. Those images, as mentioned elsewhere in this Report, show significant erosion of the bank between the facility and the Elk River.

Finally, there were verbal reports for two years of a potential water leak existed on the east side of Barlow Road. The water lines on Barlow Drive are owned and maintained by West Virginia American Water. During the clean-up and excavation of the property in the days immediately following the incident, WVAGO investigators were made aware that water testing in and around the property indicated the presence of treated/chlorinated water typically found in potable water lines. The presence of this information supports the verbal claims of a long-standing water line leak on Barlow Drive. On January 14, 2014, West Virginia American Water installed a new water line along Barlow Drive adjacent to the existing line.

7.2 Overall Deterioration and Neglect of Property

The most significant contributing factor to the water leak and contamination of the Elk River was the overall neglect and deterioration of the facility. Specifically, tank 396 and others were corroded and aged; the containment wall was in need of repair and had structural deficiencies; and the concrete pads between the ASTs were cracked, splintered, and in need of repair. Most disturbing was that the owners of Freedom Industries and predecessor company Etowah Terminal had been made aware of the conditions through their own internal inspections, and yet appear to have done little to alleviate the hazard.

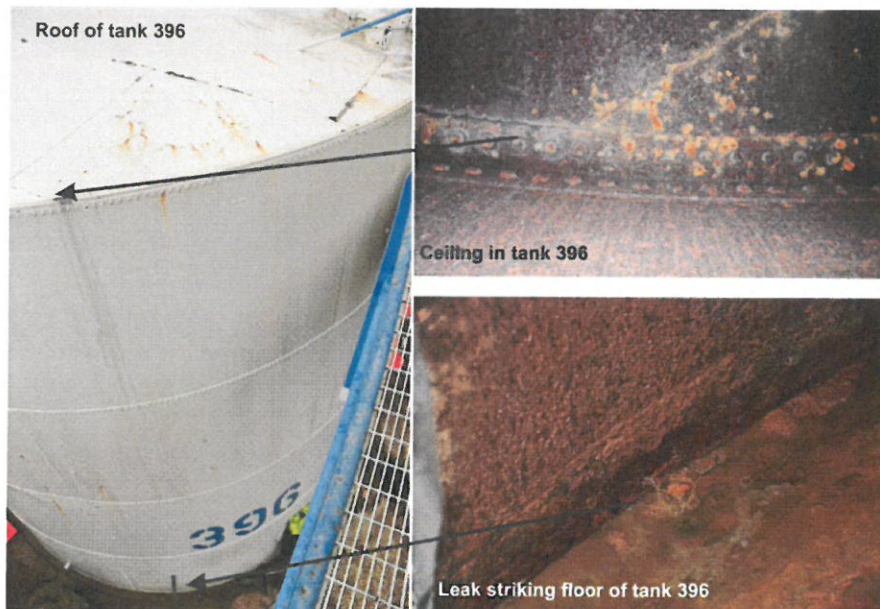
7.2.1 Deterioration and Neglect of Tank 396

Tank 396 was one of three aboveground storage tanks originally constructed by Elk Refining Company in 1938. A visual inspection of the tank showed its age, and



clearly reflected minimal upkeep of the tank. Despite significant documentation and reports regarding other larger tanks, little documentation or inspection reports were produced by Freedom relating to the maintenance or inspections of tank 396.

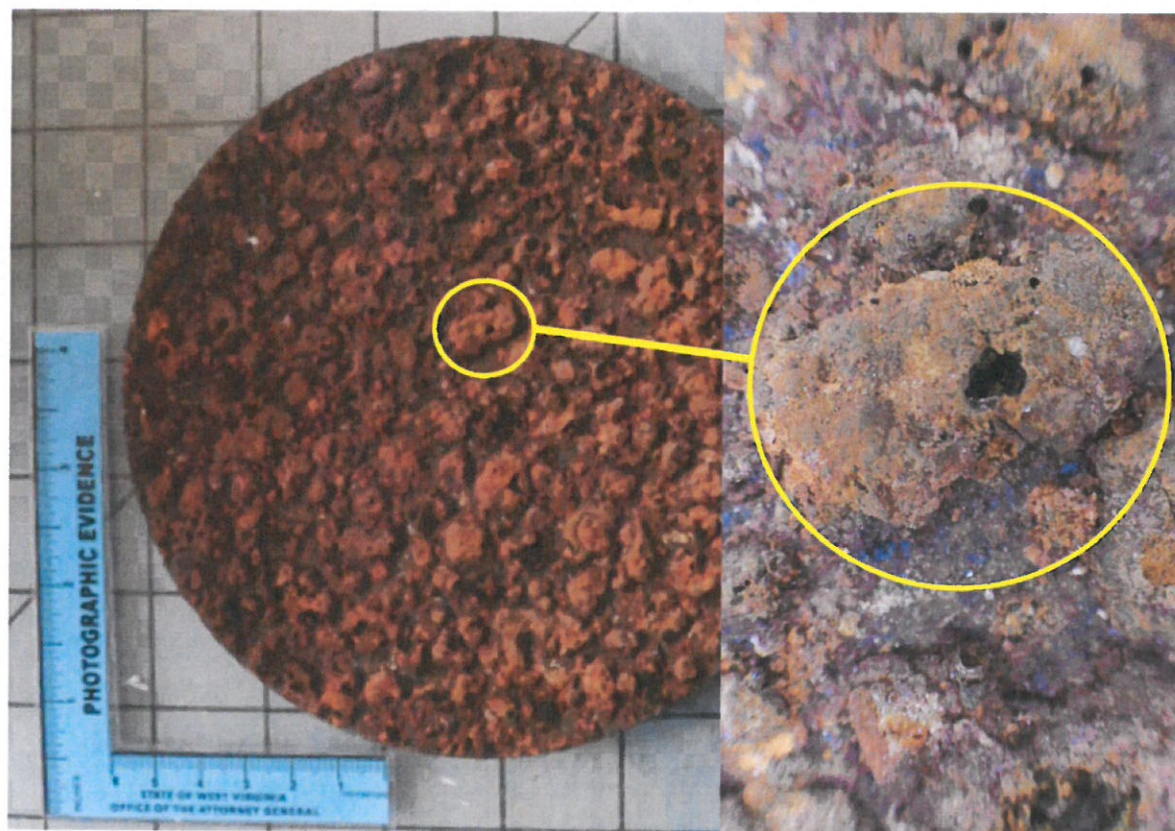
During the course of the investigation, the WVAGO photographed and documented the physical appearance of tank 396 and surrounding tanks. As reflected, in the photographs, the outside of tank 396 had flaking paint, rusting, and pitting. In addition, an inspection of the inside of the tank revealed neglect. First, the roof of the tank was leaking.



Second, a liner/patch was discovered in the bottom of the tank over the corrosion.



Third, signs of corrosion inside the tank were observed.



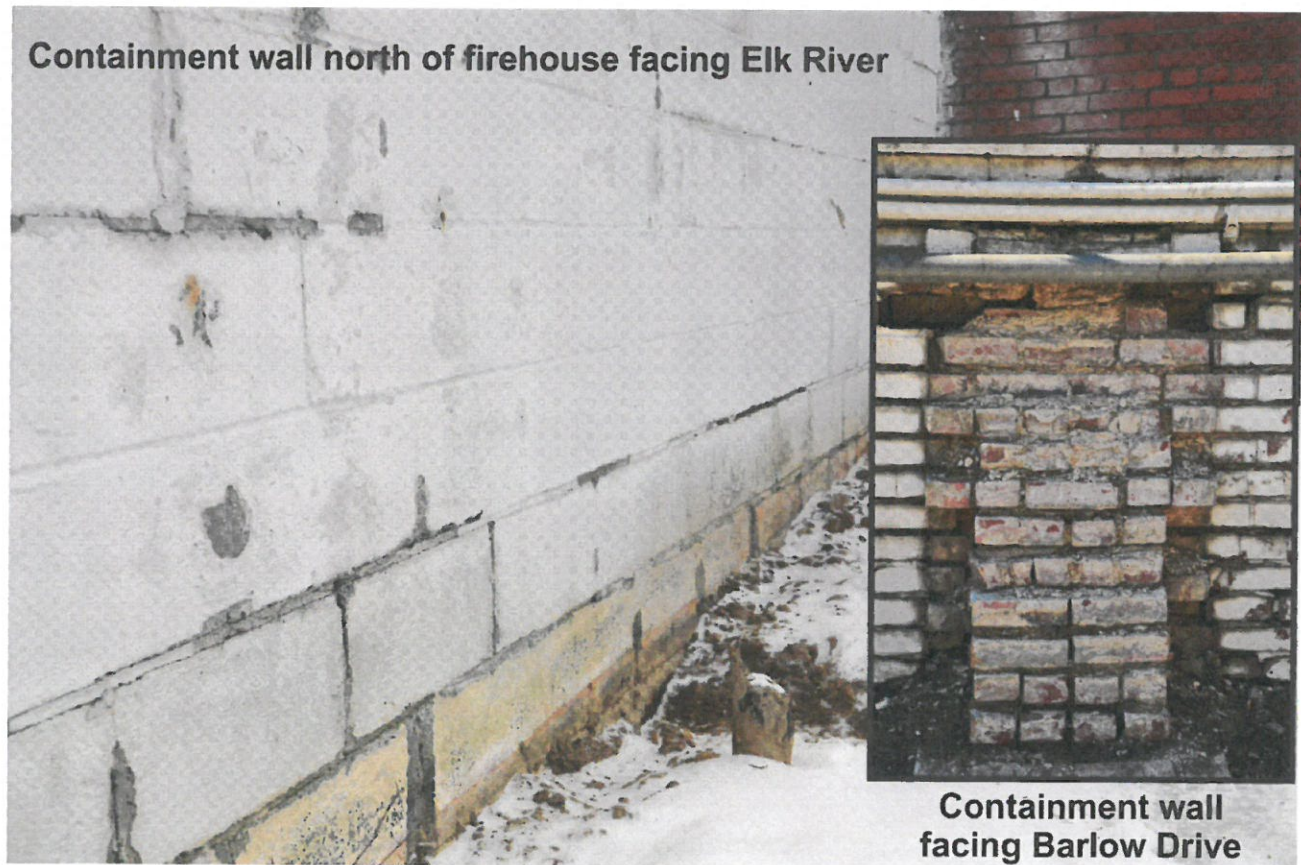
Corrosion on inside of coupon removed from side of tank 396

Most importantly, at least two holes were present in the bottom of tank 396, and caused the leaking of the chemical product from inside of tank 396.

Similar observations were made to the outside of tank 397, and at least one hole was discovered in the base of tank 397 when it was subsequently torn down and inspected.

7.2.2 Containment Wall Needed Repair

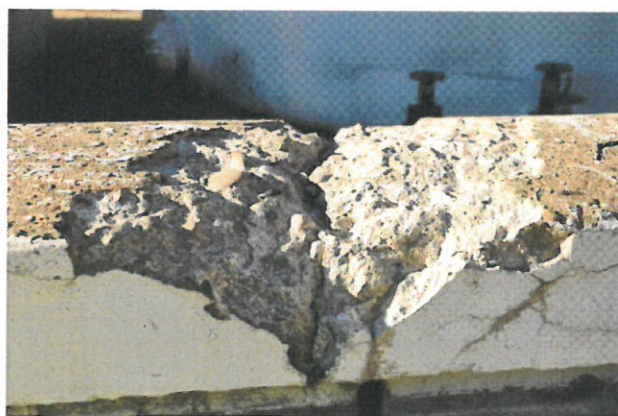
The purpose of the containment (dike) wall was to contain any spill or release of the product from the tanks. The walls, constructed of cinderblocks or bricks, had deteriorated to the point where bricks had broken apart or were completely missing. Cement mortar was missing from between the blocks in several areas.





The containment wall running east and west that separated tank 402 from 403 had deteriorated to the point that it was leaning to the north. Concrete caps consisting of either brick and/or cinderblock were used around the top of the containment wall. However, like its structural base, the caps had also deteriorated to the point that some of the mortar

between the blocks and some of the mortar caps were missing. For example, in one section of the west containment wall, a large section of cap was missing, which exposed the open top of the cinderblocks and the hollow center. The deteriorated or missing cap allowed for the infiltration the elements, which further compromised the effectiveness of the dike walls.



Cap of brick containment wall facing Barlow Drive



Missing cap on containment wall facing Elk River

There is little information or documentation concerning the maintenance or repairs of the dike. Documents show that a six hundred foot concrete liner had been built inside the west containment wall in dike two (2) in 1991. In addition, re-pointing of the concrete

mortar in the cinderblock dike walls was visible at some areas at the site. Self-inspection reports conducted by Etowah Terminal employees from 1998 to 2000, repeatedly point out that the containment wall was in need of repair.¹⁶

TANK INSPECTION LOG	
	DIKE WALL AROUND 398-399-400
	401-402 NEED REPAIRED
	393-394-395-396-397-392
	DIKE NEEDS REPAIRS

A review of records did reflect that a portion of the wall in the area that houses tanks 403, 404, and 405 was repaired on May 1, 1998. However, despite documentation reflecting that the containment wall around 398, 399, 400, 401, and 402 needed to be repaired, there is no evidence to support that those repairs ever took place.¹⁷

With respect to the area around the leak, it was noted in both July and September 2000 that the containment wall around tanks 393, 394, 395, 396, 397, and 392 needed to be repaired. No documentation was found showing that such repairs were ever made.

Overall, the containment walls at the facility were of such poor condition that they lacked the ability to contain any meaningful spill or release, and failed to serve their intended purpose on January 9, 2014.

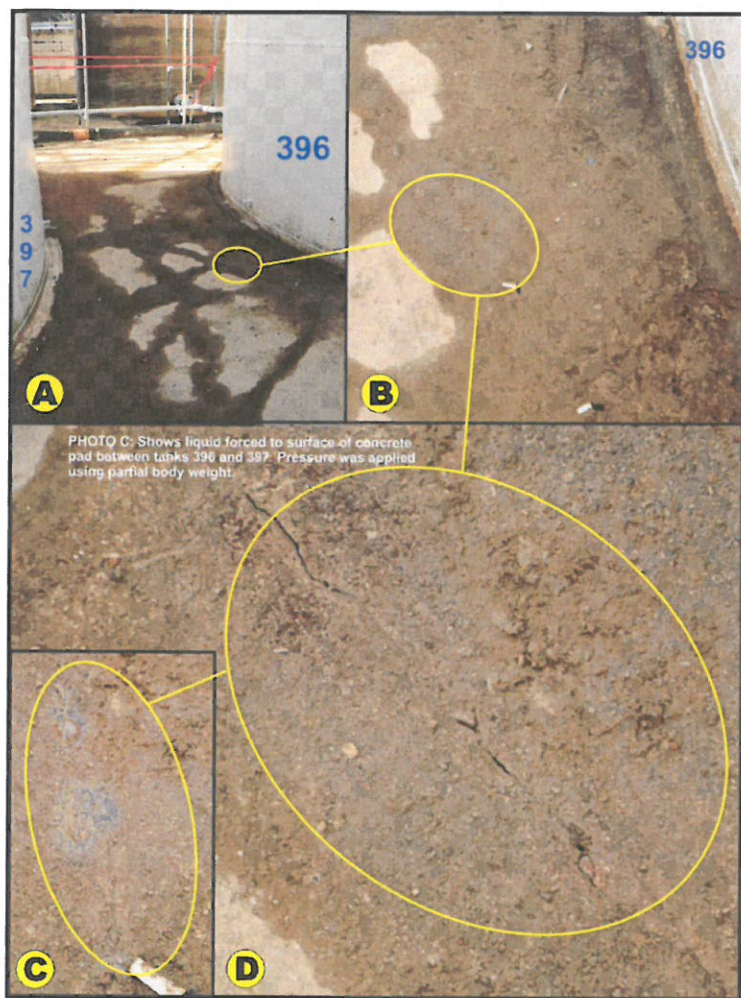
7.2.3 Concrete Pad Needed Repair

Another area within the facility that lacked necessary maintenance was the concrete pad around the tanks. Areas of concrete around tank 396 were examined and found to contain cracks. Investigators were able to apply pressure using their own body weight to one of these areas and force liquid from underneath the concrete to the top of the concrete pad.

The investigators did note that some sections of the concrete pad had been removed to facilitate recovery of the spilled chemical from around the tank.

¹⁶ Oil Pollution Act-1990, Facility Response Plan, Section 7.0 Self Inspection

¹⁷ Id



The WVAGO investigators also noted that the concrete pads sloped down toward the chime of the tanks. This slope allowed for the buildup of dirt, mud, and other debris, and for the pooling of water around the chimes of the tanks. The investigation did not determine if the slope of the concrete was a construction defect, or was caused by erosion and/or settlement of the ground beneath the tanks.

This concrete pad defect or settlement situation surrounded tanks 395, 396 and 397. It remains unknown to the investigators when precisely the concrete pad was

installed, but it is clear that the installation occurred after the erection of the tank.

Unfortunately, due to this existing drainage issue, there was a buildup of water and debris around the chime of the tanks. Indeed, this was a serious concern expressed by Etowah Terminal/Freedom Industries engineer Mike Burdette in his memo in 2010. The slope and positioning of the concrete pad allowed water to pool around the tank and contributed to the leak of tanks 396 and 397.

7.2.4 Severe Erosion of Hill between Facility and Elk River

The river bank in front of tank 396 suffered severe erosion prior to the January 9 spill. In fact, the erosion was significant enough for even a casual observer to see. Moreover, investigators charted this erosion as far back as 2007 with aerial images. Aerial imagery produced on June 12, 2007, by Pictometry International Corporation shows

ground erosion on the embankment west of the dike wall near the fire house as the embankment travels towards the Elk River.



On March 10, 2010, Pictometry International Corporation again prepared aerial images showing the Etowah River Terminal. This image shows that the ground erosion documented on June 12, 2007, had continued and was considerably worse.



Company officials were aware of the erosion as evidenced in four (4) proposals made by Ryan Environmental Inc. on March 23, 2009, to control the river bank erosion.¹⁸ The erosion problem was not corrected and was still present when investigators arrived at the terminal on January 13, 2014.

The lack of action in repairing the eroding bank once again shows the longstanding disregard for maintenance of the property by company officials.

7.3 Historical Inspections of the Facility

Over the course of its ownership, the facility has been inspected by a variety of contractors and inspectors. While investigators were unable to obtain inspection reports dating back to the early Elk Refining years, WVAGO investigators did obtain and review documents relating to some of the inspections.

For instance, the WVAGO obtained documentation of self-inspection dating from when the facility was owned by PQS. There were multiple reports between 1998-2000 reflecting self-inspection and action memos. Similarly, Etowah Terminal employees also documented issues at the facility. One of the more noteworthy memos was from Mike Burdette, Freedom Industries Operations Manager. In an Idea Form dated March 31, 2010, Mr. Burdette documented that the “Tanks within the dike area are setting in water due to a lack of adequate drainage.” He continued, “All of the tank bottoms for the ten large tanks at this facility have been replaced since original installation. Slope of grade is not away from the tanks and water stands in numerous areas as well as in direct contact with the tank chime and (bottom). This is the most critical point of a tank with respect to structural integrity. Any failure of this weld or steel plate would result in a potentially catastrophic failure.” Mr. Burdette offered two alternatives to remedy this problem: 1. Do nothing and replace tank bottoms when loss of containment occurs, or 2. Dig trenches to try and move water away from the tank chime and towards the sumps. Additional internal and outside inspections under the ownership of Etowah Terminal, LLC had already taken place prior to Burdette’s 2010 Idea Form.

¹⁸ Letter from Ryan Environmental to Roger Arthur, March 23, 2009

In 2007, Etowah River Terminal contracted Visions Inspections, LLC, to perform

[IDEA FORM]

Idea No.:		Title:	Improve Dike Area Drainage	
Review/Revision Date:	19 March 2009	Rev. Level:	0.0	Doc. Mgr.(s): Mike Burdette
Reviewed/approved by:				Signature(s):
Controlled Copies:	Electronic: Freedom Intranet Hard copy:			

ORIGINATOR: Mike Burdette	Location: Etowah	Date: 3/31/10
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*** Section 1: Describe the problem or opportunity**

Tanks within the dike area are setting in water due to lack of adequate drainage.

*** Section 2: Describe the proposed solution**

Add field drainage to carry water away from tank chimes to local area sumps equipped with a pump. May require removal of stone/soil to lower the elevation and replace with clean stone to obtain proper drainage within the dike.

*** Section 3: Justification (Safety, Quality, Production, Productivity, Cost Reduction, Sustaining, etc)**

All of the tank bottoms for the 10 large tanks at this facility have been replaced since original installation. Slope of grade is not away from the tanks and water stands in numerous areas as well as in direct contact with the tank chime (bottom). This is the most critical point of a tank with respect to structural integrity. Any failure of this weld or steel plate would result in a potential catastrophic failure.

*** Section 4: List at least 2 alternatives (3 alternatives is preferred and no alternative is to include -- "Do nothing" as an option)**

1. Do nothing and replace tank bottoms when loss of containment occurs
2. Dig trenches to try and move water away from tank chime and towards the sumps.
- 3.

***Section 5: Decision (HOLD, RECYCLE, GO, or KILL)**

Decision:

Notify Originator of Decision

Assign Project Number if approved:

***Required Fields**

Return completed form to Mike Burdette

Page 1 of 1

inspections of the tanks at the terminal. Their findings confirm the deficiencies of the containment wall. Reports also consistently document that "[t]he dyke wall has general damage which could impact containment."¹⁹

The report listed the severity of this damage at 3 on a 1 to 4 scale, (1= slight, 2=moderate, 3=severe, 4=very

severe). In addition, Visions Inspections, LLC, notes in its reports that many of the tanks were "overdue" for an internal inspection with the last known inspection being in 1994. Tank 398 is noted as having significant corrosion of the chime plate, "which could impact the tanks ability to maintain containment." This tank was also involved in a fire which may

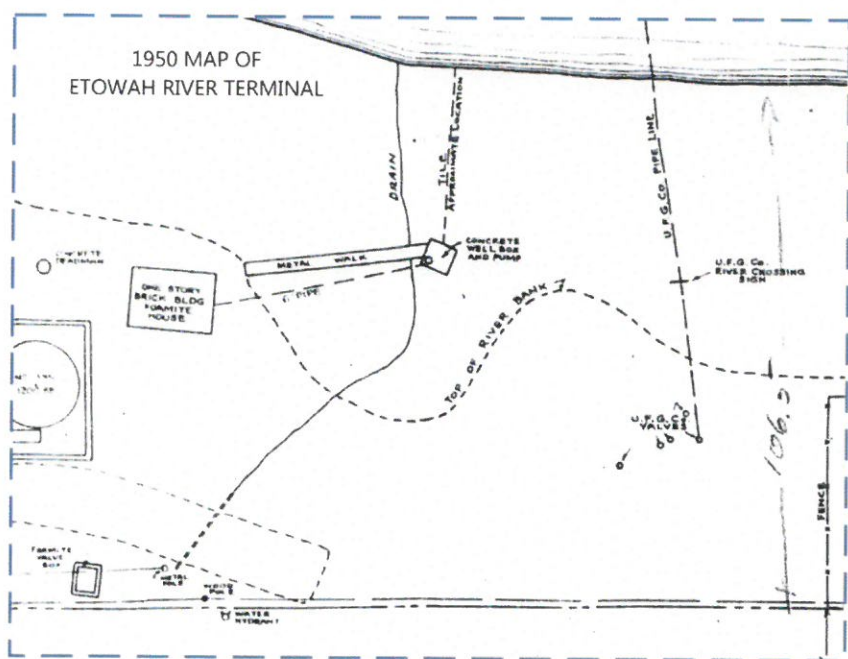
¹⁹ Visions Inspections LLC inspection report

have caused additional stresses. Many of the other chime plates are described as having soil and gravel on them. Most of the tanks are noted as not being properly grounded.

The fact that the issues were known in 2007 and then appeared again in 2009 shows a clear, ongoing problem at the facility. Yet, based upon information available to the WVAGO, no action appears to have been taken to alleviate the problems. Further, the failure to accept the bid from Ryan Environmental Inc. on March 23, 2009 or to subsequently address the erosion with another company further reflects the knowledge of Etowah Terminal/Freedom Industries regarding the fundamental causes of the potential deficiencies of the tanks. Notwithstanding these obvious warning signs, Etowah Terminal/Freedom Industries failed to take reasonable, necessary corrective action.

7.4 Use of Fill Dirt over the Contours of the Elk River for Installation of More Tanks

One of the most disturbing findings of this investigation was the fact that tanks 393 and 394 appear to be built partially on fill. A large portion of the ground on which the tanks rest was filled in prior to their installation. This is significant because much of the



ultimately into the river.

The site location of the fill could also have resulted in another catastrophe at the site. During the investigation, it was determined that tanks 393 and 394 had developed a

product that escaped the confines of the tank ran north due to the slope of the concrete slab to the containment wall in front of tanks 393 and 394. In this area, a significant amount of the product went through and under the containment wall, then flowed into and through the rubble filled bank, and

tilt and were leaning towards the Elk River. These tanks were immediately to the north of tanks 395 and 396 and were the last of the large steel tanks built on the tank farm, likely between 1951 and 1954. In a 1950 Etowah Plant Site Map, there is a distinct indentation of the river bank in the area where tanks 393 and 394 later are placed.²⁰

On August 2, 2010, tank 394 is documented as being 6 inches out of plane, which is listed as a very severe issue requiring immediate attention.²¹ On March 2, 2011, Visions notes that tank 393 is misaligned. The misalignment is at 9.25 inches on August 10, 2010, and 10.5 inches on March 2, 2011, showing further tipping of 1.25 inches over a period of seven (7) months. The tipping is toward the river.²² While the leak of tank 396 was a catastrophic event, it brought to light other potential problems at the facility and may have prevented an even larger event from occurring with tanks 393 and 394.

8.0 SUMMARY OF FINDINGS AND CONCLUSIONS

1. Freedom Industries, Inc., is a producer of freeze conditioning agents, dust control palliatives, flotation reagents, water treatment polymers, and other special chemicals for the mining, steel and cements industries. It stored many of the chemicals it sells in tanks at the Etowah River Terminal, 1015 Barlow Drive, Charleston, West Virginia.
2. Freedom Industries, Inc., was incorporated in 1992 but has existed in its current form only since December 31, 2013, when four companies, Freedom Industries, Inc., Etowah River Terminal, LLC, Poca Blending, LLC, and Crete Technologies, LLC, merged under the umbrella of Freedom Industries, Inc.
3. Gary Southern was the president of Freedom Industries, Inc. Chemstream Holdings owns 100% of Freedom Industries. J. Clifford Forrest owns Chemstream Holdings which was formed in 1997.

²⁰ 1950 Etowah Plant Site Map

²¹ Visions Inspections LLC report

²² API 653 Inspection Report for tank 393 by Visions Inspections dated 03-02-2011

4. On January 9, 2014, there were thirteen large metal storage tanks, as well as other smaller metal and resin storage tanks located at the Etowah River Terminal.
5. Tank 396 sat on gravel and soil with a concrete pad poured around the base of the tank. The concrete pad did not extend underneath the tank.
6. The contents of tank 396 leaked from the base of the tank northwest to the containment wall in front of tanks 393 and 394. Chemicals then leaked through and under the containment wall into the rubble filled ground leading to the Elk River.
7. The contents of tank 396 also traveled through a corroded culvert and/or the path created by water leaking from the culvert. The culvert runs between tanks 395 and 394 and over the embankment to the river.
8. Tank 396 held 88.5 percent crude MCHM, 7.3 percent PPH, and 4.2 percent water by weight on January 9, 2014. MCHM is a mixture of water and six chemicals used as a frothing agent for cleaning coal. PPH is hydrophobic glycol ether.
9. Tank 396 was installed in 1938 and is the same construction type and dimensions as tanks 395 and 397. They are twenty feet high and have a diameter of twenty feet with a capacity of approximately 46,200 gallons each.
10. On January 9, 2014, John O'Dell, an employee of Freedom Industries, Inc., discovered a chemical leaking from tank 396 at Etowah River Terminal. The chemical was observed to have pooled into a two-foot ring around the entire base of the tank. The chemical was observed to ripple up from under the tank and onto the surrounding concrete pad.

11. John O'Dell reported the spill to Dennis Ferrell, who was in the company of a representative of DEP. DEP received complaints from the public beginning about 8:00 a.m. of a licorice odor. Based upon previous complaints associated with the odor, they responded to the Etowah River Terminal.
12. At 11:56 a.m., DEP employee Richard Hackney notified West Virginia American Water Company of the leak.
13. At 12:05 p.m. Freedom Industries, Inc., employee and safety officer Bob Reynolds called the emergency response hotline to report the spill.
14. WVAW responded by adding additional carbon to their filter system. At 2:00 p.m. WVAW detected a presence of MCHM inside the plant. By 4:00 p.m., the MCHM had overwhelmed the filter system. At 5:45 p.m., WVAM issued a Do-Not-Use notice.
15. In an attempt to recover the product during the initial hours and days following the spill from the surface around the tanks, sump holes were dug to retrieve the chemicals and a containment pond was constructed on the bench between the tank farm and the river.
16. An unknown amount of MCHM made its way into the Elk River and subsequently into the intake at West Virginia American Water. Freedom Industries, Inc., is located along the Elk River, approximately 1.5 miles upstream from the intake of West Virginia American Water.
17. Erosion on the river bank between the tank farm and the Elk River was plainly visible by June 2007. The erosion was known by Freedom Industries Inc. as early as March 2009. This erosion became considerably worse (as evidenced by aerial imagery in 2010) and was present when the spill was detected on January 9, 2014.

18. The dike or containment walls surrounding tanks 395, 396, and 397 had deteriorated to the point that the concrete cap was missing from certain sections and mortar was loose or completely missing from sections of the containment wall. Containment walls surrounding other tanks were also in a state of decay. Bricks were missing and sections of the wall were leaning or tilting inward.
19. A concrete pad surrounding tank 396 had multiple cracks within inches of the tank's base. These cracks also were an avenue for liquid on top of the concrete pad to drain to the soil below the tank farm. In addition, the concrete pad sloped downwards toward the tank, which allowed for a pooling of mud, dirt, debris, and water around the base of the tank and tank chime.
20. A metal culvert running underneath the tank farm in the vicinity of tank 396 had corroded, allowing water to make its own path under the tank farm. This was a source of the erosion on the river bank leading towards the Elk River. This same path allowed the spilled MCHM to travel to the Elk River.
21. Tank 396 contained at least one hole near the southeast edge of the roof. This hole allowed water to enter the tank.
22. Two holes were found in the floor of tank 396 near the edge of the northwest corner.
23. The holes in the bottom of the tank did not simply appear on January 9, 2014; the corrosion process had been working for some time. Coupons cut from tank 396 require additional testing to determine the length of time the tank was compromised.
24. A latex liner or patch was on the bottom of tank 396 at the time of the leak.

25. It is not possible to determine how long the product may have been leaching into the surrounding ground under the tank, but because of the chemical's strong odor, it did not appear to come to the surface and be exposed in any meaningful manner to the air or river until the morning of January 9, 2014.
26. The extreme cold temperatures occurring during the days prior to January 9 may have contributed to the leak. Frozen ground under the tank may have prevented the chemicals from seeping any further into the soil and forced the chemicals up and around the chime of the tank where it was first seen by a Freedom employee.
27. There was a hole measuring 0.2 centimeters in the floor of tank 397.
28. There was historical negligence at the Etowah River Terminal that resulted in the deterioration of tanks 396 and 397, a flaw in the concrete pad surrounding the tanks, a failure of the culvert traveling underneath the tank farm, and a breach of the secondary containment wall that ultimately resulted in the contamination of the Elk River.

9.0 CONCLUDING COMMENTS

This independent report is solely the work product of the Office of the Attorney General. The information contained herein is that of the Attorney General's Office and employees who engaged in the review; and does not reflect the opinion or work product of any other state entity.

This report is based on the information available to the Attorney General and his team during the investigation. Given the nature of the matter and the review that was conducted, this report does not purport to be all inclusive nor preclude the possibility that additional information may be available that may alter the analysis and recommendations contained herein. Indeed, given the nature of the review, access to documents maintained by private companies, government entities, or individuals may have been limited.